REMARKS

Favorable reconsideration of this Application and the Office Action of January 3, 2007 are respectfully requested in view of the following remarks.

Clams 1 to 28 appear in this application. Claims 13 to 26 and 28 stand withdrawn from consideration under 37 CFR 1,142(b) as being directed to the non-elected invention.

Amended claims 4, 7, 16 and 19 correct misspellings, eliminate a typo in claim 21, and insert missing commas. Claims 1, 13, 27 and 28 have been amended by inserting the amount of components (c) and (d) from claims 2 and 14, respectively, deleting the amounts from the latter claims, and stating the novel property possessed by the claimed composition. Support for this last mentioned amendment to claims 1, 13, 27 and 28 is found in the specification at paragraphs [0005], [0006] and the first sentence of paragraph [0007].

The rejection of claims 1-4, 8-11 and 27 over Koito et al. (US 2003/0130147) under 35 U.S.C. 103, and claims 5-7 and 12 under 35 U.S.C. 103 over Koito et al. (US 2003/0130147) in view of Hara et al. (US 2002/0128164) are again both respectfully traversed.

The USPTO rejections are based on the position that any and all cleaning of microelectronic devices of any type is one and the same process. That is certainly not so, and those skilled in the art clearly recognize that fact. As the composition of the microelectronic devices changes (as they are constantly doing), those skilled in the art are presented with new problems associated with cleaning the revised devices and must address new sets of problems, since what has worked in the past on previous devices does not work on the new or altered microelectronic devices. What was known to work on one type of microelectronic device will not work to clean the new type of device, or the revised or altered devices present a whole new set of cleaning problems not heretofore

addressed. Each different type of substrate presents new and unique cleaning problems. The different substrates are each different "animals' to deal with presenting unique problems.

It is submitted that a proper and complete understanding of the **context** of the present invention vis-a vis the **context** of the prior art disclosure clearly shows the unobvious and patentable nature of the cleaning compositions of this invention for cleaning new style microelectronic devices that present new cleaning problems. As microelectronic device fabrication has advanced certain new problems have developed. Due to issues with electrical performance and reliability in mass production, a variety of metal stacks are now being utilized for forming gate lines in flat panel display (FPD) technology. Multiple metal layers such as Mo/AlNd/Mo, and especially double layers such as Mo/AlNd, AlNd/Ti, and AlNd/Cr are common for gate line metal stacks in current manufacturing of FPD technologies. However, in stacks where the AlNd alloy is located beneath another metal, aluminum corrosion during the rinse step can be a critical problem for electrical performance. This corrosion is commonly known as overhang and can create voids that weaken the metal structure. Loss of aluminum to corrosion during the chemical cleaning or water rinse steps can also create notching in the metal lines, which is a most common defect at FPD technology. The composition of the cleaning solution and its behavior in water plays a key role in causing corrosion. A typical photoresist remover for FPD applications might include polar organic solvents blended with organic amines and other solvating agents. Amines have been shown to increase the effectiveness of photoresist removal in solvent blends. However, the water rinse following use of this type of cleaner or remover can create a strongly alkaline aqueous solution and that can lead to considerable loss of metal from the patterned lines. This necessitates an intermediate rinse between the cleaning/stripping step and the aqueous rinse. Such an intermediate rinse, typically with isopropyl alcohol, adds undesirable time, safety concerns, environmental consequences, and cost to the manufacturing process. Thus, there was a need for a **non-aqueous** alkaline-containing stripping and cleaning compositions for photoresists that enable one to completely remove both photoresist and etch and/or ash residue from the

microelectronic substrate **yet not produce any significant metal corrosion during a subsequent aqueous rinse step**, especially for FPD microelectronic elements.

In contrast to this, the Koito et al. disclosure is directed to a completely different cleaning context. Koito et al. is addressing the problem of cleaning microelectronic devices characterized by copper and low dielectric films-see their background to their invention as described in the Section titled "Description of Related Art" and paragraphs [0015] to [0017] in their "Summary of the Invention" as well as the specific examples. This is quite different that the problems addressed by the present Applicants wherein they seek to solve the need for a **non-aqueous** cleaner/stripper/remover that clean microelectronic substrates characterized by a variety of metal stacks for forming gate lines in flat panel display (FPD) devices without producing any substantial metal corrosion in a subsequent aqueous rinse and not require any intermediate rinse for **a variety of metal stacks now being utilized for forming gate lines in flat panel display (FPD) technology**. That problem is addressed by the **non-aqueous** cleaning compositions of the present invention and is completely different that the problem and cleaning type of the cited prior art.

Applicant's claims are directed to a **non-aqueous** composition for cleaning microelectronic substrates that comprises:

the following components:

(f) a nucleophilic amine,

(g) a moderate to weak acid having a strength expressed as a "pKa " for the dissociation constant in aqueous solution of from about 1.2 to about 8,

(h) a compound selected from the group consisting of an aliphatic alcohol, diol, polyol or glycol ether in an amount of from about 20% to about 60% by weight of the composition, and

(i) an organic co-solvent in an amount of from about 25% to about 70% by weight of the composition,

and the weak acid component (b) is present in the composition in an amount such that the equivalent mole ratio of acid/amine is greater than .75 and the pH of the

composition is from about pH 4.5 to 9.5.

The Office Action again admits, at page 5, second full paragraph, that the Koito et al. disclosure does "not teach, with sufficient specificity, a composition having the specific pH containing a nucleophilic amine, a moderate to weak acid, a glycol ether, a co-solvent, and the other requisite components of the composition in the specific proportions as recited by the instant claims." Koito et al. does not even address the same problem addressed by the present Applicant.

Furthermore, contrary to the contention of the USPTO action there is no teaching in the Koito et al. patent disclosure that both a nucleophilic amine and a moderate to weak acid must both be present and that the acid has to be present in an amount such that **the equivalent mole ratio of acid/amine is greater than .75**, as is required by the present invention. The Office Action erroneously asserts, based only on the hindsight of Applicant's disclosure that the broad teachings of Koito et al. "suggest compositions having the same mole ratio of acid to amine as recited by the instant claims." Such a contention is preposterous. Firstly, Koito el al. does not even require that both a nucloephilic amine and a weak or moderate acid have to be present in their compositions, let alone in the mole ratio required by the present invention.

Secondly, **the compositions of Koito et al. do not have an organic co-solvent**, as required by the **non-aqueous** compositions of the present invention. The compositions of Koito et al. are compositions that employ no solvent or co-solvent. Thus, the Koito et al. disclosure cannot suggest a non-aqueous composition of the present invention that is organic solvent-based as are Applicant's claimed compositions. The Office Action does not, because it cannot, contend that Koito et al. discloses cleaning compositions that are organic solvent based.

The PTO still rejects the claims over the Koito et al. disclosure on the unsupported basis that all these deficiencies in the Koito et al. reference disclosure is simply cured by

the assertion that **"the broad teachings of Koito et al.** would make the modification obvious to one skilled in the art". The PTO must read the disclosure of Koito et al **in context, not merely try to extract some broad contention therefrom merely to attempt to meet Applicant's invention.** Clearly, the PTO only makes this contention on the basis of having read Applicant's disclosure since absolutely nothing except the hindsight of Applicant's disclosure suggests all these criteria in common. However, the specific suggestion for all such parameters to be selected and met must come from the teaching in the prior art, without hindsight reference to Applicant's disclosure. Nothing in the Koito et al. disclosure suggest a composition of all of Applicant's required components in the amounts specified, and particularly cannot suggest an organic solvent based composition of those components. Such hindsight reconstruction of the prior art is improper and renders this rejection erroneous.

Additionally, the compositions of Koito et al. are intended for use in cleaning copper-containing substrates, whereas, is apparent from Applicant's disclosure, Applicant's compositions are intended for use against microelectronic substrates characterized by a variety of metal stacks for forming gate lines in flat panel display (FPD) devices without producing any substantial metal corrosion. These different substrates have differing strippability and non-corrosion requirements and, therefore, it is not possible to extrapolate the teaching of composition intended for copper (Koito et al.) to compositions intended for microelectronic substrates characterized by a variety of metal stacks for forming gate lines in flat panel display (FPD) devices (Applicant's).

The PTOdismisses the argument about strippability of different substrates vs copper substrates on the basis that composition claims do not recite for cleaning such substrates, and even it they did, that would be an intended use and not a patentable limitation. Applicant, in response to that position of the PTO, points out that the claims do not need to recite that limitation since they are composition claims. The PTO position does not address the issue and completely misses the point and significance of Applicant's argument. **The novel and unobvious properties of the claimed composition when employed for**

cleaning microelectronic substrates characterized by a variety of metal stacks for forming gate lines in flat panel display (FPD) devices **provides novel and unobvious properties to the claimed composition. To make that even more clear to the USPTO that property of the composition is now recited in the claim. The limitation is worded so as to a recitation of a property, not a statement of intended use.** It is elementary that properties of compounds or composition must be considered in determining the patentability thereof. This has been elementary patent law since the case of *In re Papesch,* 315 F.2d 381, 137 USPQ 43, 50 (CCPA 1963). Thus, the fact that the claimed non-aqueous compositions have the property of being able to produce the unexpected, herein before described results in cleaning microelectronic substrates characterized by a variety of metal stacks for forming gate lines in flat panel display (FPD) devices, provides nonobvious and patentable status to the claimed compositions and the USPTO dismissal of those arguments is clearly erroneous since such properties must be considered in determining the patentability of the claimed compositions. The PTO has not addressed this principle of patent law as highlighted above and detailed in the Papesh decision that the properties of a composition are an inherent part of the claimed composition and must be addressed in assessing the patentability of a composition. The PTO instead has simply ignored this principle and given no consideration to the unobvious properties of Applicant's claimed composition. To do so is clearly erroneous on the part of the PTO. When those properties of Applicant's claimed composition are considered the unobviousness of the claimed composition over the prior art is readily apparent.

It is clearly recognized that there are three type of preambles in chemical cases: those describing a property of the recited composition, those naming the article made from the recited composition, and those stating a use for the recited composition. The first type of preamble is clearly recognized as capable of imparting patentability to the composition over the prior art where the prior art does not teach a composition of the recited property. *Kropa v. Robie et al.,* 88 USPQ 478, 483 (CCPA 1951). The statement in Applicant's claim preamble is such a statement of a property of the composition and is a patentable limitation and it is error for the USPTO to disregard such claim limitation.

Applicant again points out that the disclosure in Koito et al. clearly shows that the low amounts of water in the Koito et al compositions demonstrate that, in their use setting, the presence of low amounts of water results in unacceptable results. **Every specific composition disclosed in the examples in Koito et al. contains water. There is no disclosure of any composition without water**. Moreover, even more pertinent is the fact that the specific compositions illustrated in **Koito et al. clearly show that when there is little water in their compositions the compositions do not provide suitable strippability**. See Table 1, agent # 5 and table 2, agents # 12 and # 13 containing 4% water. Their strippability is an unacceptable "C". i.e., "damage observed". See also Table 8, agent # 24 with only 1% water, where film damage is rated "D", i.e., "damage was significant". Thus, for this reason, the Koito et al. disclosure cannot teach a **non-aqueous** composition, **and particularly a non-aqueous composition meeting all the other parameters and requirements of Applicant's claims**. The PTO attempts to refute this specific showing in Koito et al. by contending that "..the Examiner maintains that the damage which occurred to substrates as shown in the examples of Koito et al was not attributed to the amount of water used but to various mixtures of different alkanolamines and corrosion inhibitors." This contention is clearly erroneous. **Table 1 of Kioto et al. clearly demonstrates that it is presence of the water that causes the unacceptable result since examples 1-9 in that Table all contain the same components and the amount of water changes and therefore the examples are directly comparable**. Thus, it is clearly demonstrated that it is the lack of sufficient water that Koito et al. shows to be detrimental. The PTO's contention attempts to compare apples with oranges, **i.e. compositions of different components which are not directly comparable and from which no conclusion about the effect of water can be drawn.** Thus, Applicant's position is clearly supported by the data results in Koito et al. and the PTO's position is unsupported and totally erroneous.

Moreover, the Koito el al. patent clearly teaches the need for water and that low amounts of water provide less suitable strippability-see paragraph [0088] next to last

sentence, and also the end of paragraph [0133]. There is no showing in Koito et al. that any non-aqueous or even very low aqueous composition works for Koito et al. The PTO erroneously fails to give any consideration of these specific teachings of Koito et al. but instead attempts to base the rejection on some undefined, nebulous "broad teachings" of Koito et al., which compositions do not even contain an organic solvent.

The PTO also attempts to state that it is "unclear" that the strippability unsuitable properties are attributable to water referring to Table 6. This is clearly a red herring and an erroneous contention since the data in Tables 1 and 8 have comparisons between compositions that have the same components either with lots of water or with only a little water. Thus, the lack of water is clearly shown to be the causative factor leading to the undesired strippability results. This fact makes the present Applicant's invention even more unexpected and unobvious. The results the PRO points to are not comparable since the compared compositions do not have the same components.

Furthermore, the composition defined by claim 12, as well as claim 24, does not have an alcohol having an ether-bond in the molecule as required by the Koito et al compositions and, thus, this composition is unobvious for this additional reason.

Therefore, in view of the foregoing, the USPTO is respectfully requested to reconsider and withdraw the rejection of claims 1-4, 8-11 and 27 are rejected over Koito et al. (US 2003/0130147) under 35 U.S.C. 103.

The rejection of claims 5, 6,7 and 12 under 35 U.S.C. 103 over Koito et al. (US 2003/0130147) in view of Hara et al. (US 2002/0128164) is likewise respectfully traversed. The deficiencies of the Koito et al. disclosure, as discussed herein before, are not cured by Hara et al. and this Section 103 rejection of claim 5, 6, 7 and 12 is also erroneous for the same reasons, and its withdrawal is respectfully requested.

Moreover, as stated in Applicant's previous Responses, the compositions of Hara et

al. are completely different types of compositions than those of Koito et al. and the two teaching are not combinable. The PTO has erroneously dismissed this contention, in the RESPONSE TO ARGUMENTS section of the Office Action, on the grounds that Koito et al. and Hara et al. are in "the same general field of endeavor and are used for cleaning and/or stripping semiconductor substrates". This completely overlooks and erroneously dismisses the fact that in the field of microelectronic strippers **not all microelectronic stripping compositions operate the same way** and those that operate by different mechanisms (s discussed previously in this present response) prevent their teachings from being combined (combined out of context as is attempted to be done by the PTO in formulating this rejection). The compositions disclosed in the Hara et al. document are not only highly aqueous, but even more significantly are an entirely different type of compositions than the type of compositions of Koito et al. and also of the present invention. The compositions of Hara et al. are **aqueous compositions** that **must contain a peroxide oxidizing agent and a quaternary ammonium salt,** neither of which is employed in Applicant's **non-aqueous** compositions. The peroxide-containing (oxidizer-containing) compositions of Hara et al are compositions that **have a cleaning mechanism (oxidization) that is completely different from the compositions of Koito et al**. and also from the compositions of Applicant's invention and thus operate via a different cleaning mechanism. Therefore, any teaching of equivalency of components in the differently operating compositions of Hara et al. cannot be extrapolated to any kind of equivalency in a completely different composition of Koito et al. or for that matter in the different compositions of the present claims, that have a completely different cleaning mechanism because of the different type of compositions involved. **The PTO has not answered this factual reality that the two references are for compositions acting in completely different manners and thus their teachings are not combinable for this very reason.**

Since the cleaning mechanisms of Hara et al. and Koito et al. operate by different cleaning mechanisms, there is no basis for the conclusion of the PTO that equivalency of components in Hara et al. would lead one skilled in the art to expect those components to operate equivalently in a composition that operates by a totally different cleaning

mechanism, as was explained here before. Thus, the reliance on Hara et al. to show some alleged equivalency is clearly erroneous, making the rejection of Applicant's claims erroneous, and the PTO is respectfully requested to reconsider and withdraw the rejection of claims 5, 6 7 and 12 under Section 103 over Koito et al. in view of Hara et al.

Furthermore, Hara et al. fail to disclose that the cleaning compositions **must** contain a nucleophilic amine, a moderate to weak acid having a strength expressed as a "pKa " for the dissociation constant in aqueous solution of from about 1.2 to about 8, a compound selected from the group consisting of an aliphatic alcohol, diol, polyol or glycol ether, and an organic co-solvent, and the weak acid component (b) must be present in the composition in an amount such that the equivalent mole ratio of acid/amine is greater than .75 and that the composition has a pH of from about 4.5 to 9.5. No such composition is disclosed, taught or even remotely suggested by the disclosure in Hara et al.

Hara et al. only optionally has an amine component. The acid component in Hara et al. is also optional and only as a corrosion inhibitor, not as a neutralizer for a nucleophilic amine component. Nothing in Hara et al teaches that both these "optional" components must both be present and that a moderate to weak acid of pKa of about 1.2 to about 1.8 must be employed when a nucleophilic amine is employed and that the acid must be present in the composition in an amount such that the equivalent ration of acid/amine is greater than 0.75 and that the composition has a pH of from about 4.5 to 9.5.

Furthermore, when one looks at what Hara et al. actually disclose, the differences from the present invention become even more apparent. Every example of a composition of Hara et al. is an **aqueous composition having a very significant amount of water**. In Table 1 the amount of water in the compositions ranges from 60 to 90%, in Table 2 the amount of water ranges from 25 to 90%; and in Table 3 the water ranges from 55 to 90 %. In contrast, Applicant's claimed compositions are non-aqueous compositions. Because of the different way the oxidizing composition of Hara et al. go about cleaning microelectronic substrates nothing in Hara et al. teaches one to eliminate the water and provide a non-

aqueous composition, nor to eliminate the absolutely critical peroxide or quaternary ammonium salt components of Hara et al.

In addition, as stated herein before, the Koito et al. compositions do not have any organic solvent component. The Koito et al compositions only contain alcohols with ether bonds as corrosion inhibitors, purine corrosion inhibitors. amines, weak acids, and water. Thus, it is abundantly clear that there is absolutely no basis for stating that one would use a "solvent" disclosed in Hara et al. in the compositions of Koito et al. that are **free of any organic solvent. The suggestion of the PTO flies in the face of the disclosure of Koito et al's solvent free compositions**. For these reasons the erroneousness of the rejection is readily apparent and the USPTO is respectfully requested to reconsider and withdraw this Section 103 rejection of claims 5-7 and 12 over Koito et al. (US 2003/0130147) in view of Hara et al. (US 2002/0128164).

After withdrawal of these rejections Applicant request rejoinder of claims 13 to 26 and 28 with claims1 to 12 and 27, per *In re Ochiai*, 71 F. 3d 1565, 37 USPQ2d 1127 (Fed. Cir. 1995). For permitting that rejoinder applicant has amended the withdrawn use claims to have the same scope as the elected composition claims.

It is respectfully submitted that the foregoing is a full and complete response to the Office Action and that all the claims are allowable for at least the reasons indicated. An early indication of their allowability by issuance of a Notice of Allowance is earnestly solicited.

Respectfully submitted,

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